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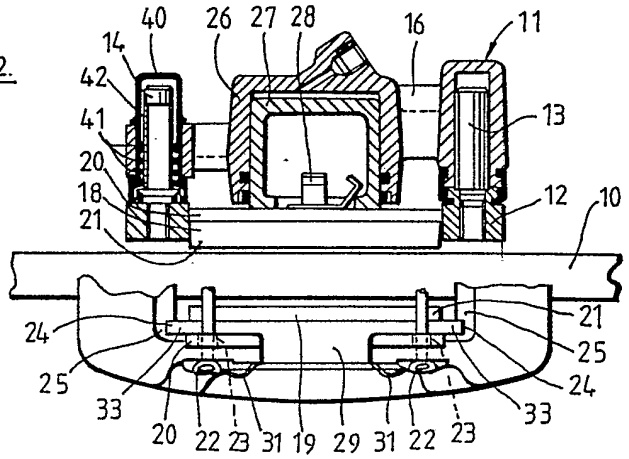
(54) Disc brake

(57) A spring clip 29, for retaining one brake pad 19 of a disc brake against the limb of the brake caliper 11 which is remote from the brake actuator 26, 27, has a first pair of spring elements 31 extending one on either side from one flange (32, Figure 3) of an angular central portion (30), for engagement with the outside face of the limb; and a second pair of spring elements 33 extending one on either side from the other flange (34, Figure 4) of the central portion (30), for engagement with the face of the backing plate 20 of brake pad 19 which is remote from the limb.

FIG.2.



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The drawing originally filed was informal and the print here reproduced is taken from a later filed formal copy.

FIG.1.

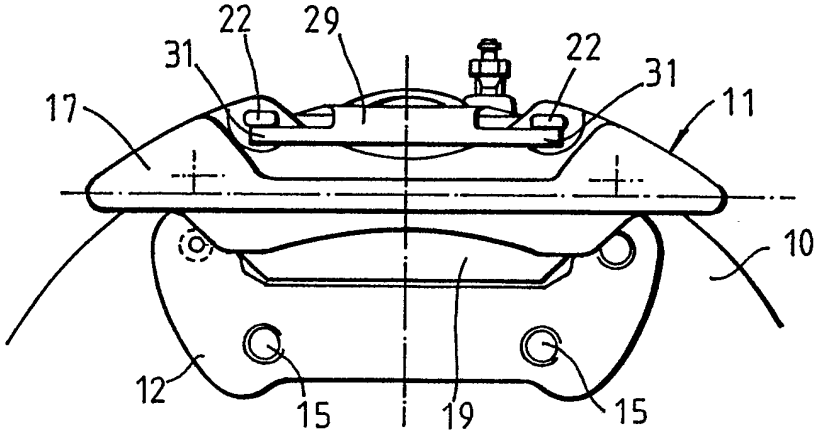


FIG.2.

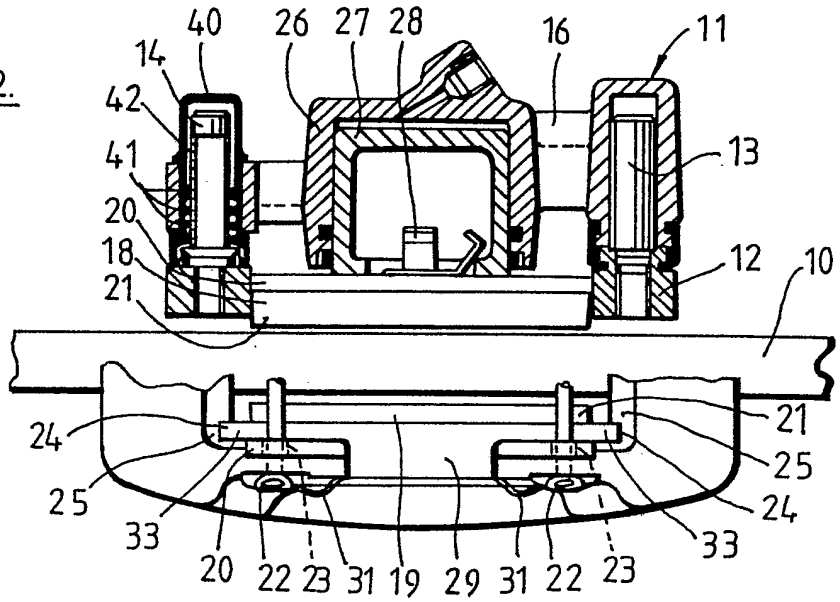


FIG.3.

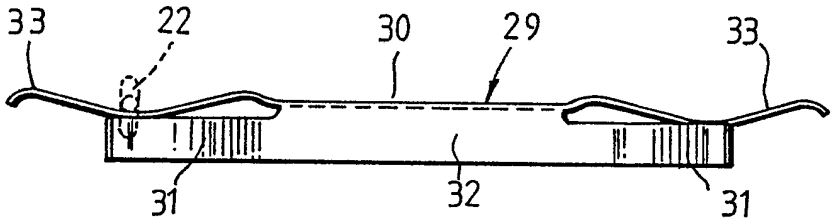
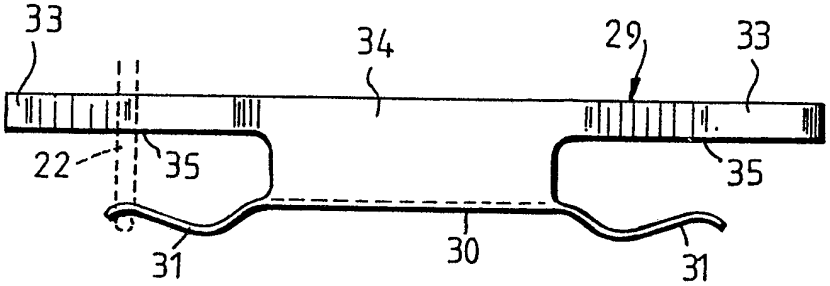


FIG.4.



SPECIFICATION

Disc brakes

This invention relates to disc brakes particularly, but not exclusively, for braking the road wheels of automobiles.

Typically a disc brake comprises a disc secured for rotation with the road wheel, a caliper assembly which straddles a portion of the peripheral edge of the disc and a support member mounted on a non-rotary part of the vehicle, upon which the caliper is slidingly located for movement relative to the disc, in a direction parallel to the axis of rotation of the disc.

The calliper comprises a pair of parallel limbs which overlap and are parallel to the disc, these limbs being interconnected by a pair of transverse limbs which are spaced radially from the periphery of the disc. A pair of brake pads are located, one on either side of the disc, between the parallel limbs of the caliper. The brake pads comprise backing plates having pads of friction material on the faces thereof adjacent the disc. These pads are located radially by means of a pair of pins which extend between the parallel limbs of the caliper, outside the periphery of the disc, the pins passing through holes in the backing plates of the pads. The holes in the backing plates are elongated to permit the pads to move over a small distance circumferentially relative to the disc, so that when brought into engagement with the rotating disc, one of the radial edge faces of each backing plate will be brought into engagement with the corresponding radial face on the caliper, depending on the direction of rotation.

A hydraulic cylinder/piston assembly is associated with one of the parellel limbs of the caliper and arranged to act on the backing plate of the adjacent pad. Application of the brakes will cause the hydraulic piston to force the adjacent brake pad into engagement with the disc and then further pressure will cause the caliper to slide on the support member, thereby bringing the opposite pad into engagement with the disc.

On release of the brakes, the hydraulic piston moves back sufficiently to provide a clearance for the adjacent pad and to permit the caliper to slide relative to the support member so that a clearance is provided for the other pad.

However, as the pads are free to move relative to the parallel limbs of the caliper, they may remain in engagement with the disc which will produce drag and will also lead to unnecessary wear of the pad. Furthermore, the pads will be free to rattle or oscillate between the disc and parallel limbs of the caliper, especially when the disc is out of true and suffers from "run-out".

Hitherto it has been proposed to clip the pad which is abutted by the hydraulic piston to the piston, so that the pad will move with the piston. It has also been proposed to provide a spring plate abutting the upper edges of the backing plates of the two pads so as to bias the backing plates against the pins and thus overcome the problem of oscillation. However, this arrangement does not positively locate the pad remote from the hydraulic piston, relative to the adjacent parallel limb of the caliper and also the spring plate closes the top of the caliper, which adversely affects ventilation of the brake.

The present invention provides for the positive location of the pad remote from the hydraulic piston, relative to the adjacent parallel limb of the caliper, thereby reducing drag and oscillation of that pad.

According to one aspect of the present invention a disc brake includes a caliper having a pair of parallel limbs interconnected at adjacent ends, one of said limbs incorporating a brake actuator; a pair of brake pads each comprising a rigid backing plate with a pad of friction material on one face thereof are disposed between the limbs of the caliper in a parallel relationship thereto with the friction pads opposing one another, said brake pads are supported on a pair of pins mounted between the limbs of the caliper; a spring clip having a central portion of angular configuration, one pair of spring elements extending axially one on either side of one flange of the central portion and a second pair of spring elements extending axially one on either side of the other flange of the central portion, said spring clip being arranged such that said one pair of spring elements resiliently engage the outside of the limb of the caliper remote from the brake actuator while said second pair of spring elements engage against the inner face of the backing plate of the adjacent brake pad, to bias the brake pad into engagement with the adjacent limb of the caliper.

An embodiment of the invention is now described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is a side elevation of a disc brake formed in accordance with the present invention;

Figure 2 is a partial plan view of the disc brake shown in Figure 1;

Figure 3 is a side elevation of the spring clip used in the disc brake illustrated in Figure 1; and

Figure 4 is a plan view of the spring clip used in the disc brake illustrated in Figure 1.

As illustrated in Figures 1 and 2, the disc brake comprises a disc 10 mounted for rotation with a road wheel (not shown). A caliper assembly 11 straddles a portion of the peripheral edge of the disc 10 and is mounted upon support member 12 by means of a pair of pins 13 and 14 which permit relative movement between the caliper assembly 11 and support member 12 in a direction parallel to the axis of the rotation of disc 10. The support member 12 is mounted on a non-rotary part of the vehicle by means of bolts passing through holes 15.

The caliper assembly 11 comprises a pair of radially extending parallel limbs 16 and 17 which overlap and are parallel to the disc 10, these limbs being interconnected at opposed ends thereof by a pair of transverse limbs which are spaced radially from the periphery of the disc 10. A pair of brake pads 18 and 19 are located on either side of the disc 10 between the parallel limbs 16 and 17 of the caliper assembly. The brake pads 18 and 19 each comprise a backing plate 20 having a pad of friction material 21 on the face thereof adjacent the disc 10. The pads 18 and 19 are located radially by means of a pair of pins

22 which extend between the parallel limbs 16 and 17 of the caliper, outside the periphery of the disc 10, the pins 22 passing through holes 23 in the backing plates 20. The holes 23 are elongated to permit the pads 18 and 19 to move over a small distance circumferentially relative to the disc so that when brought into engagement with the rotating disc 10, the pads 18 and 19 will be dragged along with the disc 10 until one of the radial faces 24 on the backing plate 20 of each pad 18 and 19 are brought into engagement with a corresponding radial face 25 on the caliper assembly, depending on the direction of rotation.

A hydraulic cylinder/piston assembly 26, 27 forms part of limb 16 of the caliper assembly 11, the piston 27 being arranged to act on the backing plate 20 of pad 18. The pad 18 is secured for movement with the piston 27 by means of a spring clip 28 mounted on the rear face of the backing plate of pad 18.

A spring clip 29 engages the outside face of the limb 17 and the inside face of the backing plate 20 of pad 19, to urge the pad 19 into engagement with limb 17.

As better illustrated in Figures 3 and 4, the spring clip 29, which is made from resilient material, comprises a central portion 30 of angular configuration, having a pair of spring elements 31 extending axially one on either side of the flange 32 of central portion 30 and a second pair of spring elements 33 extending axially one on either side of the flange 34 of central portion 30. Both pairs of spring elements 31 and 33 are spaced from the fold line of the centre portion 30, so that when spring elements 31 engage the outer face of limb 17 and spring elements 33 engage under the pins 22, the edges 35 thereof will bear against the inner face of the backing plate 20 of pad 19, to urge it towards the limb 17. Furthermore, the spring elements 31 extend under the heads of pins 22, so that they will retain the spring clip 29 in position. The ends of the spring elements 31 are also bent back away from the rear face of the limb 17, so as to engage a transverse head portion of the pins 22 thereby preventing them from rotating. The central portion of the upper edge of limb 17 is cut away to provide a clearance for the central portion 30 of clip 29, so that the force urging the pad 18 against limb 17 will be provided by the spring elements 31.

Upon actuation of the brakes, hydraulic pressure is applied to the piston 27 which urges the pad 18 into engagement with disc 10. Further application of pressure by the piston 27 causes limb 16 of the caliper assembly 11 to move away from the disc 10 on the pins 13 and 14 of support member 12. This movement brings pad 18 into engagement with the disc 10. Upon release of the brakes, roll back of the seals between the piston 27 and cylinder 26 cause the piston 27 to move back away from the disc 10 and this draws back pad 18 to provide a clearance between the pad 18 and disc 10, the pad 18 being secured to the piston by spring clip 28. Pin 14 on the support member 12 is provided with a rubber boot 40 which has a series of ribs 41 which engage a PTFE sleeve 42 on the pin 14. This arrangement also provides sufficient "roll back" on the caliper assembly 11, to allow pad 19 to move clear of the disc 10.

As the pad 19 is resiliently biassed to the limb 17 by means of spring clip 29, it will move back with the caliper assembly 11, thus avoiding the problems of drag and oscillation that have occurred hitherto. Also, the clip 19 does not block the space between the limbs 16 and 17 of the caliper assembly 11 and will not therefore reduce ventilation of the brakes. The resilient clip 29 will however permit some movement of the pad 19 relative to the limb 17 to allow for any misalignment of the disc 10 or caliper assembly 11, so that the pad 19 may engage flat against the disc 10 when the brake is applied.

CLAIMS

1. A disc brake including a caliper having a pair of parallel limbs interconnected at adjacent ends, one of said limbs incorporating a brake actuator; a pair of brake pads each comprising a rigid backing plate with a pad of friction material on one face thereof are disposed between the limbs of the caliper in a parallel relationship thereto with the friction pads opposing one another, said brake pads are supported on a pair of pins mounted between the limbs of the caliper; a spring clip having a central portion of angular configuration, one pair of spring elements extending axially one on either side of one flange of the central portion and a second pair of spring elements extending axially one on either side of the other flange of the central portion, said spring clip being arranged such that said one pair of spring elements resiliently engage the outside of the limb of the caliper remote from the brake actuator while said second pair of spring elements engage against the inner face of the backing plate of the adjacent brake pad, to bias the brake pad into engagement with the adjacent limb of the caliper.

2. A disc brake according to Claim 1 in which said one pair of spring elements engage formations on the outside face of the limb of the caliper, so as to retain these spring elements in position.

3. A disc brake according to Claim 2 in which said formations are provided by the heads of the pins.

4. A disc brake according to Claim 3 in which the pins have transverse head portions and formations are provided on said one pair of spring elements for engagement of said transverse head portions to prevent the pins from rotating.

5. A disc brake according to any one of Claims 1 to 4 in which said second pair of spring elements engage formations which maintain these spring elements in engagement with the inner face of the backing plate of the brake pad.

6. A disc brake according to Claim 5 in which said second pair of spring elements engage under the pins upon which the brake pad is supported.

7. A disc brake according to any one of the preceding claims in which the central portion of the upper edge of the limb of the caliper remote from the brake actuator is cut away to provide a clearance for the central portion of the spring clip.

8. A disc brake according to any one of the preceding claims in which the pad adjacent to the

brake actuator is secured for movement with the brake actuator.

9. A disc brake substantially as described herein with reference to, and as shown in, Figures 1 to 4 of the accompanying drawings.

Amendments to the claims have been filed, and have the following effect:-
(b) New or textually amended claims have been filed as follows:-
(c) Claims 2-9 above have been re-numbered as 3-10 and their appendancies corrected.

2. A disc brake according to Claim 1 in which said one pair of spring elements are provided by extensions of said one flange and said second pair of spring elements are provided by extensions of said other flange, the extensions of the flanges defining the spring elements being spaced away from the fold line of the central portion.

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